Dead material and gaps between PV modules

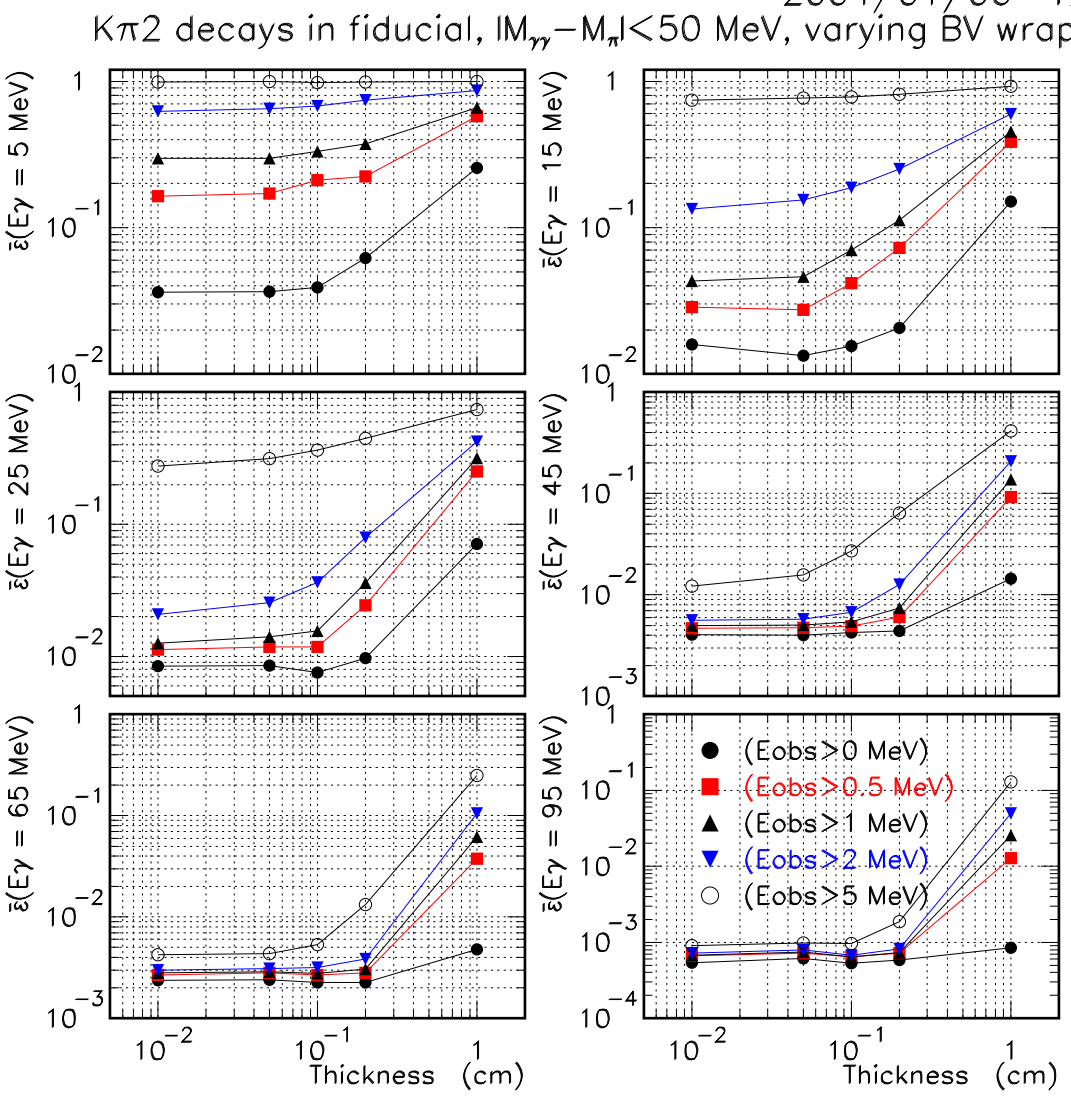
We performed a GEANT3 study of the effect of dead material and air gaps between the modules of the barrel photon veto. For the purpose of the study, each PV module was encased in a 'wrapper' composed of either iron or air. $K_L^0 \rightarrow \pi^0\pi^0$ decays were generated in the decay volume and at least two photons were required to strike the PR. The PV inefficiency of the remaining photons was investigated.

Conclusions drawn from figures on next pages:

1. There is essentially no change in the photon veto inefficiency for up to 2 mm of dead material (iron) between barrel veto modules for a 1 MeV threshold.
2. There is no change in the photon veto inefficiency for up to 4 mm of air between barrel veto modules for thresholds up to 5 MeV.

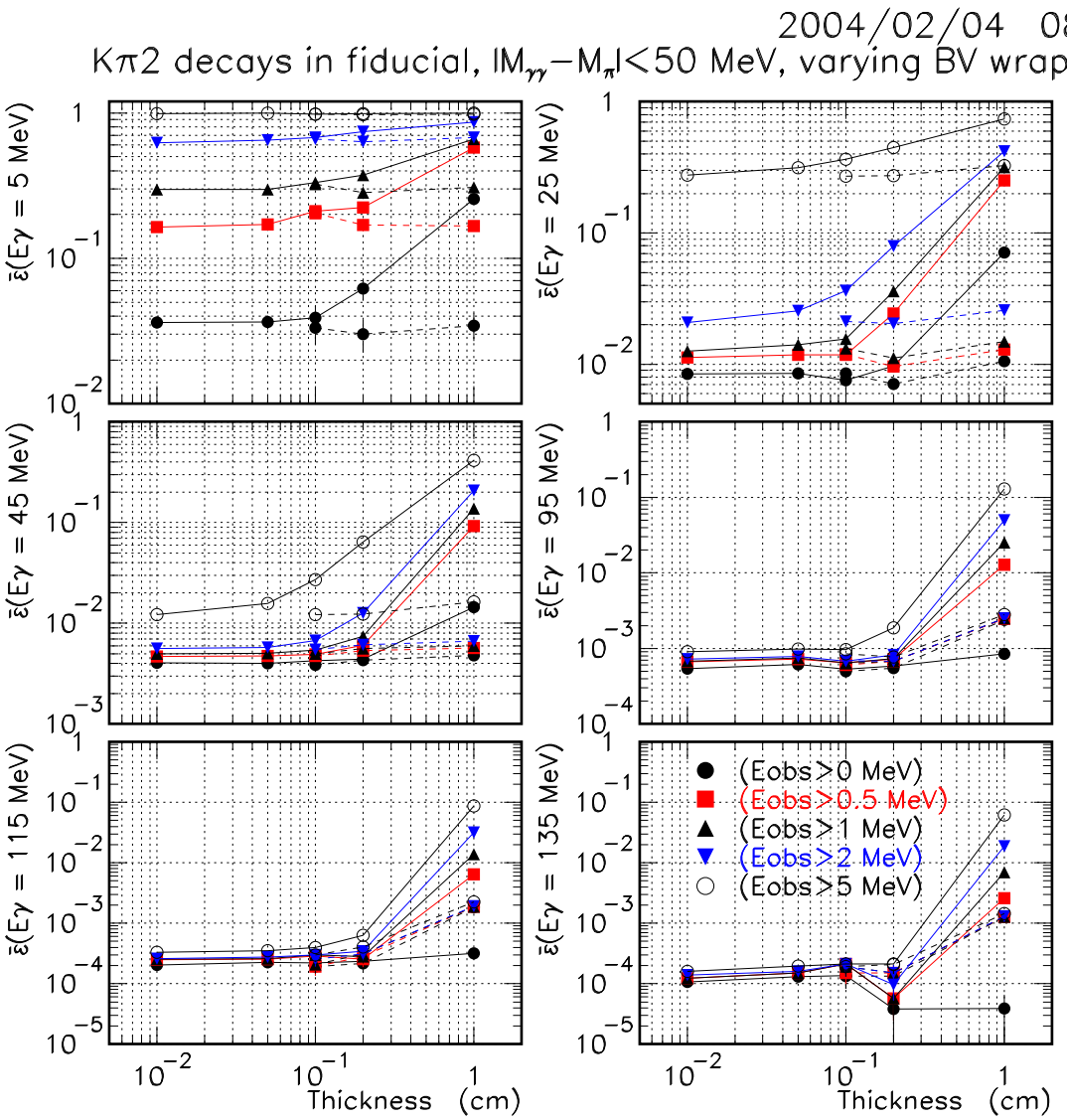
Based on additional simulation, we expect similar behavior for other photon vetos including the calorimeter. We expect ≤ 0.5 mm of material between modules for the photon vetos and the calorimeter. The cables and support for these detectors are external to the active elements; support for the CPV is small and the cables egress non-projectively. The PV performance is based on measurements on a real detector with cracks, cables, etc.

Dead material between PV modules (GEANT3 study)



Photon veto inefficiency as a function of iron wrapper thickness and energy threshold for six photon energies. (E_{obs} is approximately a third of the deposited energy.) The photon energy range is ± 5 MeV about the value given, so the upper right plot is for $10 < E_\gamma < 20$ MeV. There is essentially no change in the photon veto inefficiency for up to 2 mm of dead material (iron) between barrel veto modules for a 1 MeV threshold.

Air gaps between PV modules (GEANT3 study)



Photon veto inefficiency as a function of wrapper thickness and energy threshold for six photon energies.

Points with the same energy threshold connected with a **solid line** correspond to an **iron wrapper**. Points connected with a **dashed line** correspond to an **air wrapper**.

There is no change in the photon veto inefficiency for up to 4 mm of air between barrel veto modules for thresholds up to 5 MeV.